

Gait Adaptability Training Improves both Postural Stability and Dual-Tasking Ability

Rachel A. Brady,¹ Crystal D. Batson,² Brian T. Peters,¹ Robert J. Ploutz-Snyder,³
Ajitkumar P. Mulavara,³ and Jacob J. Bloomberg⁴

¹Wyle Integrated Science and Engineering Group, Houston, TX, USA; ²MEI Technologies, Inc.,
Houston, TX, USA; ³Universities Space Research Association, Houston, TX, USA; and

⁴Neuroscience Laboratories, NASA Johnson Space Center, Houston, TX, USA

After spaceflight, the process of readapting to Earth's gravity commonly presents crewmembers with a variety of locomotor challenges. Our recent work has shown that the ability to adapt to a novel discordant sensorimotor environment can be increased through preflight training, so one focus of our laboratory has been the development of a gait training countermeasure to expedite the return of normal locomotor function after spaceflight. We used a training system comprising a treadmill mounted on a motion base facing a virtual visual scene that provided a variety of sensory challenges. As part of their participation in a larger retention study, 10 healthy adults completed 3 training sessions during which they walked on a treadmill at 1.1 m/s while receiving discordant support-surface and visual manipulations. After a single training session, subjects' stride frequencies improved, and after 2 training sessions their auditory reaction times improved, where improvement was indicated by a return toward baseline values. Interestingly, improvements in reaction time came after stride frequency improvements plateaued. This finding suggests that postural stability was given a higher priority than a competing cognitive task. Further, it demonstrates that improvement in both postural stability and dual-tasking can be achieved with multiple training exposures. We conclude that, with training, individuals become more proficient at walking in discordant sensorimotor conditions and are able to devote more attention to competing tasks.